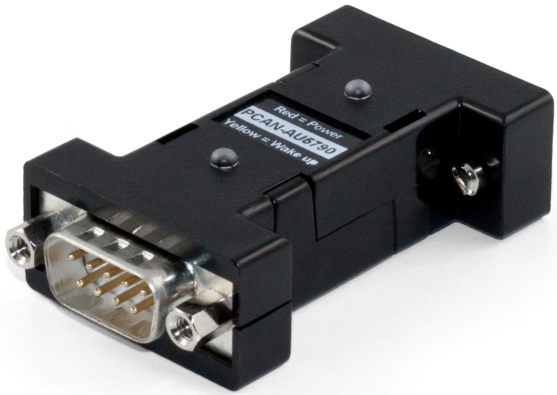
PCAN-AU5790

Bus Converter High-speed CAN to Single-wire CAN

User Manual



Document version 2.1.0 (2013-11-15)

PEAK System

Products taken into account

Product Name	Model	Part number
PCAN-AU5790		IPEH-002040

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1 Introduction

Tip: At the end of this manual (Appendix C) you can find a **Quick Reference** with brief information about the installation and operation of the PCAN-AU5790.

The bus converter PCAN-AU5790 establishes a connection between a High-speed CAN bus (ISO 11898-2) and a Single-wire CAN bus (SAE J2411). It is designed for direct connection of a CAN interface of the PCAN series (e.g. PCAN-USB) to a Single-wire CAN bus. The term AU5790 refers to the transceiver of the same name. This (or a compatible transceiver) is used in the bus converter for the connection to the Single-wire CAN bus.

Single-wire CAN

Single-wire CAN only uses one signal line in contrast to High-speed CAN. Single-wire CAN is used in motor vehicles. The bodywork functions as ground of the bus. Therefore the Single-wire CAN bus actually consists of an unipolar line and thus reduces the overhead of the wiring through the motor vehicle. On the other hand the highest possible transmission rate is considerably lower than for High-speed CAN.

1.1 Properties at a Glance

- There are three operation modes for the SW-CAN side which can be set using a sliding switch. Normal (33.3 kbit/s), High-speed (83.3 kbit/s) and Wake-up
- Indicator LEDs for power supply (red) and wake-up signals (yellow)

- Power supply (5 V, 150 mA) through High-speed CAN connection (a current list of PEAK CAN interfaces with suitable supply voltage is available on request)
- If the power supply has a lower current output than 150 mA, an additional 12-Volt supply is needed via Single-wire CAN connector
- Operating temperature range from 0 to 70 °C (32 to 185 °F)

Note: You can find additional information about the properties and the behavior of the Single-wire CAN transceiver AU5790 in the corresponding data sheet which you can download, for example, from the NXP website: www.nxp.com

1.2 Scope of Supply

- Adapter in plastic casing
- Manual in PDF format

2 Connectors

2.1 D-Sub Socket: High-speed CAN, Primary Voltage Supply

The bus converter PCAN-AU5790 is designed for the use as add-on module for a CAN interface of the PCAN series (e.g. PCAN-USB). As an extension it is directly connected to the CAN interface with the High-speed CAN side (D-Sub socket).

Attention! Risk of short circuit! When you connect the PCAN-AU5790 to or remove it from the CAN interface, latter must be turned off (without supply voltage). The PCAN-AU5790 or other electronic components may be damaged.

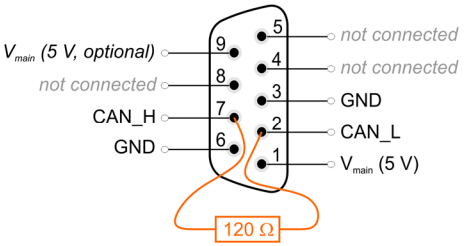

Figure 1: Pin assignment High-speed CAN side (D-Sub socket)

2.1.1 Supply Voltage V_{main}

For the bus converter operation a direct voltage of 5 V (V_{main}) is needed. The voltage source must be able to supply a current of up to 150 mA.

Note: If the voltage source cannot supply a current up to 150 mA, an additional voltage supply must be used on V_{aux} at the Single-wire CAN connection. This applies, for example, to all CAN interfaces of the PCAN series with galvanic isolation ("opto-decoupled").

For the voltage supply of the bus converter a CAN interface of the PCAN series must be configured so that the 5-Volts supply of the computer is routed to either pin 1 or pin 9 of the High-speed CAN connector. Please take detailed notes from the documentation of the respective CAN interface.

When the 5-Volt supply is active, the **red LED** on the PCAN-AU5790 is on.

2.1.2 Voltage Supply Alternatively Via Pin 9

The bus converter is pre-configured to be supplied via pin 1 of the connector. Alternatively the voltage supply V_{main} can be done via pin 9. For that a modification must be done on the PCB of the PCAN-AU5790.

Important note: Perform the following procedure with special care, because soldering can incur unintentional short circuits on the PCB. This can lead to damage of the bus converter or the connected hardware.

Do the following to route the voltage supply via pin 9:

1. Open the plastic casing of the PCAN-AU5790 by cautiously levering the latches on both sides, e.g. with a flat tip screwdriver.
2. On the bottom side of the PCB in the soldering field JP1, a 0-Ohm resistor connects the lower two pads (see Figure 2). Unsolder the resistor and replace it so that it connects the

upper two pads. Alternatively, you can remove the resistor and connect the pads with a solder bridge.

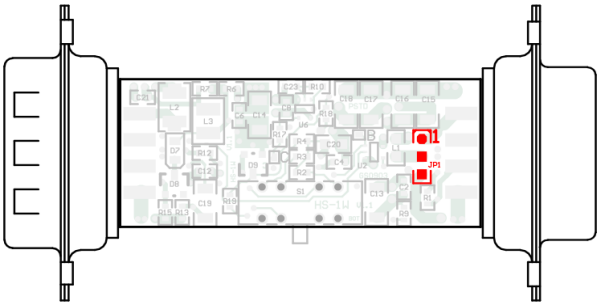

Figure 2: Position of soldering field JP1
on the bottom side of the opened PCAN-AU5790

Voltage supply via…	Pin 1	Pin 9
Connected pads on JP1		

3. Put together the two parts of the casing on the bus converter. Pay attention to the correct position because of the LEDs and the switch.

2.1.3 Termination High-Speed-CAN

The High-speed CAN lines CAN_L and CAN_H are terminated in the bus converter with an 120-Ohm resistor. This termination is unalterable.

2.2 D-Sub Plug: Single-wire CAN, Secondary Voltage Supply

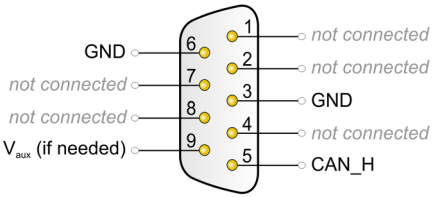

Figure 3: Pin assignment Single-wire CAN side (D-Sub plug)

2.2.1 Ground Connection (GND)

For pin allocation it has to be taken into account that a ground connection (via GND) to all other CAN nodes is needed on the Single-wire CAN bus. In motor vehicles this is usually done via bodywork.

2.2.2 Additional Supply Voltage V_{aux}

The additional supply voltage V_{aux} with 12 V DC (e.g. car battery, 6 - 16 V possible, at wake-up mode 12 V min.) is needed if the 5-Volt supply V_{main} at the High-speed CAN connector cannot provide up to 150 mA current. This applies, for example, to all CAN interfaces of the PCAN series with galvanic isolation (“opto-decoupled”).

Note: The 5-Volt supply V_{main} at the High-speed CAN connector must remain when using V_{aux}.

2.2.3 Termination Single-wire CAN

On the Single-wire CAN side the PCAN-AU5790 is terminated internally with 5.1 kΩ. The Single-wire CAN specification does not include an external termination of the bus converter with a terminating resistor.

3 Operation

3.1 Status LEDs

LED	Meaning
Red	Power supply 5 V
Yellow	Reception/transmission of wake-up signals on the Single-wire CAN bus (see also section 3.2.3 *Wake-up* Mode on page 11)

3.2 Single-wire CAN Operation Modes

The PCAN-AU5790 can be operated in three different Single-wire CAN modes. They are determined by the slide switch at the side of the casing.

Switch position	Mode	Description
Middle	Normal	Up to 33.3 kbit/s, with waveshaping
Right	High-speed	Up to 83.3 kbit/s, without waveshaping
Left	Wake-up	Like normal mode, but with increased signal levels

The **Sleep mode**, defined in addition for Single-wire CAN, is not supported.

Note: To prevent mistakes: The term “high-speed mode” in this manual refers to Single-wire CAN and does not have a direct relation to High-speed CAN.

3.2.1 Normal Mode

This mode is used for normal operation. Bit rates up to 33.3 kbit/s are supported. The output of signals on the Single-wire CAN bus is done with waveshaping. The voltage slew rate and the shape of the rising edge as well as the beginning of the falling edge are controlled. This behavior contributes to the minimization of EM emissions.

3.2.2 High-speed Mode

The PCAN-AU5790 provides a high-speed mode for the transfer of software or diagnostic data, for example. Bit rates up to 83.3 kbit/s can be used. In contrast to the normal mode, the waveshaping function is deactivated, i.e. the bus driver is switched on and off as fast as possible to be able to reach higher bit rates. However, the electromagnetic compatibility (EMC) consequently is reduced in comparison to the normal mode.

The high-speed mode is only used in special cases and shouldn't be used for regular operation of a Single-wire CAN bus.

3.2.3 Wake-up Mode

In this mode transmission is done with an increased level in comparison to the normal mode. An activation of all "sleeping" bus nodes in the network results from it. Sleeping bus nodes ignore normal 4-Volt levels and only react to levels with higher voltage (12 V). Because the PCAN-AU5790 itself does not have a sleep mode, incoming signals are all interpreted in the same manner independently of their level (normal or wake-up).

The **yellow LED** indicates a received or transmitted signal with wake-up level. After detection the LED switches off again with delay. Thus signals of short duration are also recognized.

3.3 CAN Bit Rate

When operating the PCAN-AU5790 it must be ensured that the bit rate on the High-speed CAN bus matches the one on the Single-wire CAN bus. No conversion or automatic adaptation of the bit rate is done in the bus converter.

Usual bit rate for Single-wire CAN:

- 33.3 kbit/s (normal mode, wake-up mode)
- 83.3 kbit/s (high-speed mode)

4 Technical Specifications

Power supply	
Supply voltage	5 V DC, at least 150 mA (via High-speed CAN connection) 12 V DC additionally, if the available amperage of the 5-Volt supply < 150 mA (via Single-wire CAN connection; 6 - 16 V possible, at least 12 V for wake-up mode)
Current consumption	20 mA average, 120 mA maximum

High-speed CAN	
Specification	ISO 11898-2 CAN specifications 2.0A and 2.0B
Transceiver	PCA82C251
Connector	D-Sub socket, 9-pin, pin assignment according to specification CiA® 102
Termination	120 Ω (unalterable)

Single-wire CAN	
Specification	SAE J2411
Transceiver	AU5790 or compatible
Connector	D-Sub plug, 9-pin
Termination	5.1 kΩ
Operating modes (bit rates)	normal (33.3 kbit/s), high-speed (83.3 kbit/s), wake-up (33.3 kbit/s)

Wake-up LED (yellow)	
Pulse width	> 0.5 s
Delay time signal	> 5 µs (at 11-Volt pulse)
Threshold signal	8.2 V

Measures	
Size	63 x 34 x 19 mm (L x W x H) See also dimension drawing in Appendix B on page 16
Weight	26 g

Environment	
Operating temperature	0 - 70 °C (32 - 158 °F)
Temperature for storage and transport	-40 - +100 °C (-40 - +212 °F)
Relative humidity	15% - 90%, not condensing
EMC	EN 55024:2011-09 EN 55022:2011-12 EC directive 2004/108/EG
Ingress protection (IEC 60529)	IP20

Appendix A CE Certificate

PCAN-AU5790 IPEH-002040 – EC Declaration of Conformity
PEAK-System Technik GmbH

Notes on the CE Symbol CE

The following applies to the "PCAN-AU5790" product with the item number(s) IPEH-002040.

EC Directive This product fulfills the requirements of EU EMC Directive 2004/108/EG (Electromagnetic Compatibility) and is designed for the following fields of application as for the CE marking:

Electromagnetic Immunity
DIN EN 55024, publication date 2011-09
Information technology equipment – Immunity characteristics – Limits and methods of measurement (CISPR 24:2010);
German version EN 55024:2010

Electromagnetic Emission
DIN EN 55022, publication date 2011-12
Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement (CISPR 22:2008, modified);
German version EN 55022:2010

Declarations of Conformity In accordance with the above mentioned EU directives, the EC declarations of conformity and the associated documentation are held at the disposal of the competent authorities at the address below:

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Signed this 22nd day of October 2013

Appendix B Dimension Drawing

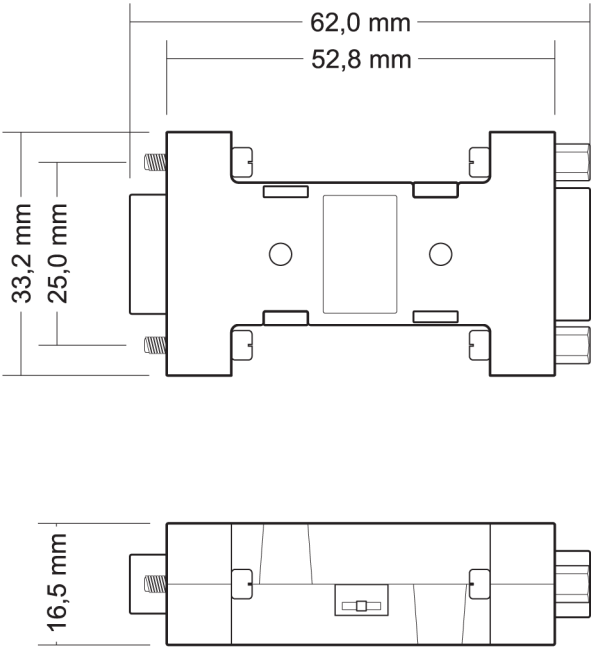

Figure 4: Top view and side view PCAN-AU5790.
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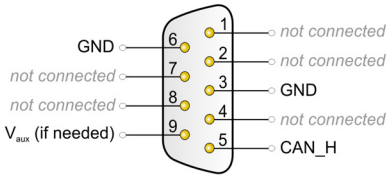
Appendix C Quick Reference

Procedure for connecting to CAN interface of the PCAN series:

1. On the CAN interface, enable the routing of the 5-Volt supply to pin 1 of the D-Sub connector (see documentation of the CAN interface).
2. Plug the PCAN-AU5790 with its D-Sub socket (High-speed CAN) onto the D-Sub plug of the CAN interface.
3. Only CAN interfaces with galvanic isolation ("opto-decoupled"): On the Single-wire CAN side of the PCAN-AU5790, connect an additional voltage supply V_{aux}.

Single-wire CAN Connector



V_{aux} = 12 V DC, e.g. car battery
(6 - 16 V possible, at least 12 V for wake-up mode)

Switch for Single-wire CAN Modes

Switch position	Mode	Description
Middle	Normal	Up to 33.3 kbit/s, with waveshaping
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Left	Wake-up	Like normal mode, but with increased signal levels

Status LEDs

LED	Meaning
Red	Power supply 5 V
Yellow	Reception/transmission of wake-up signals on the Single-wire CAN bus